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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/779,825	02/17/2004	Gottfried Ungerboeck	BP2431	9140

51472 7590 08/05/2008

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EXAMINER	
TIMORY, KABIR A	

ART UNIT	PAPER NUMBER
2611	

MAIL DATE	DELIVERY MODE
08/05/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/779,825	UNGERBOECK, GOTTFRIED
	Examiner	Art Unit
	KABIR A. TIMORY	2611

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _21 May 2008_.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-24_ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-24_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This office action is in response to the amendment filed on 05/21/2008. Claims 1-24 are pending in this application and have been considered below.

Response to Arguments

2. Applicant arguments regarding the rejection under 35 USC 103(a) as being unpatentable over Cherubini et al (US 6,741,551) in view of McCallister et al (US 6,005,897) have been fully considered and they are **not persuasive**. The examiner thoroughly reviewed Applicant's arguments but firmly believes that the cited reference reasonably and properly meets the claimed limitation as rejected.

Applicant's arguments: "The Applicant respectfully believes that McAllister does **not** teach and disclose any such rearranging of an order of the bits either going into or out of the "puncture controller 64". McAllister does teach and disclose that a bit gets punctured (i.e., deleted) within the "puncture controller 64"".

Examiner's response: On page 26, lines 17-20 of the specification of the instant application, the applicant discloses: ***"Also, other encoding techniques may also be implemented without departing from the scope and spirit of the invention including puncturing of 1 or more of the encoded bits that are output from the encoder,***

rearranging the order of 1 or more of the encoded bits that are output from the encoder, and so on".

In figure 3, McCallister et al. clearly illustrates that encoder 56 produces six encoded bits or symbols (s) in response to the three information bits processed by the PARSE 30. The output of the encoder 56 is input to Transparent Convolutional Encoder 62. The encoder 62 produces corresponding symbol pairs for the data streams in which either both symbols are inverted or neither symbol is inverted. Then the outputs of encoder 62 provide a secondary encoded bit stream to a puncture controller 64. Puncture controller 64 selectively removes predetermined bits from the secondary encoded bit stream and appropriately **restructures** (rearranges) the secondary encoded bit stream by delaying certain encoded bits as necessary (see col 6, lines 39-67, col 7, lines .

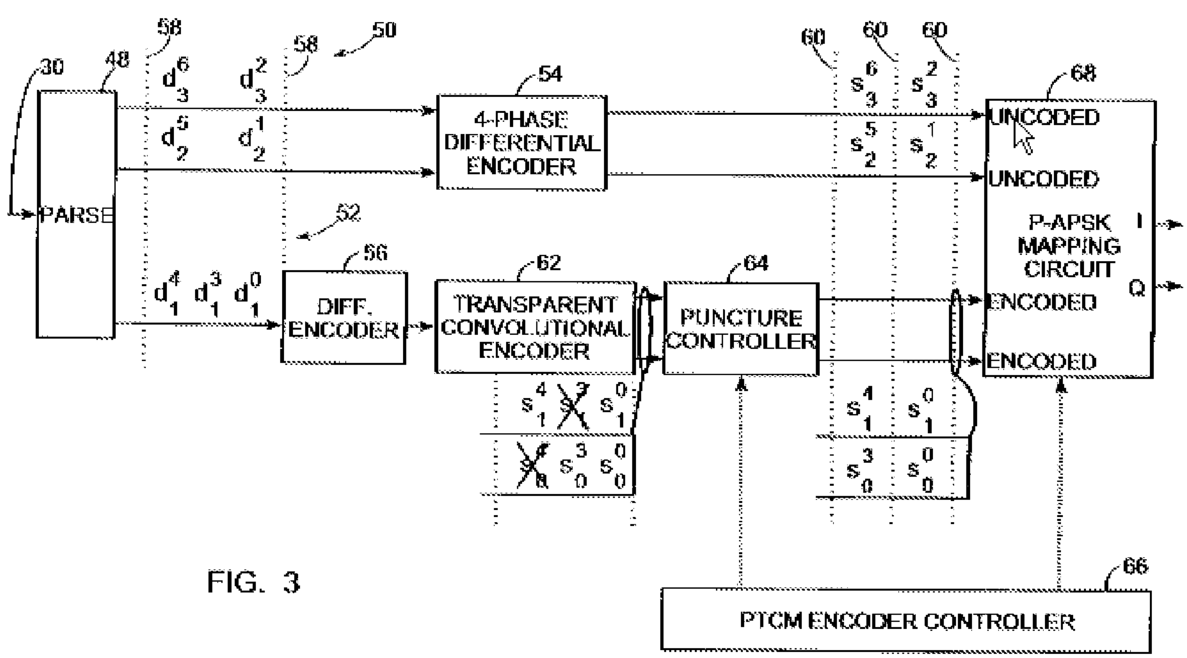

FIG. 3

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Figure 3 clearly shows how the bits are **restructured** (rearranged) after puncture controller 64. Bits are encoded by encoders 56 and 62 and are **restructured** (rearranged) at the output of the puncture controller 64. This is the same process as is broadly claimed in the claims. For example, in claim 1, the applicant claims **"rearranging an order of the plurality of encoded bits"**. Figure 3 of McCallister et al. clearly illustrates that bits are **restructured** (rearranged) after puncture controller 64.

Applicants are remained that the Examiner is entitled to give the broadest reasonable interpretation **to the language of the claim**. So the Examiner considers **"restructuring the encoded bits"** is **"rearranging an order of the plurality of encoded bits"** within the broad meaning of the term. The Examiner is not limited to Applicant's definition, which is not specifically set fourth in the claims. *In re Tanaka et al.,* 193 USPQ 139, (CCPA) 1977.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cherubini et al. (US 6,741,551) in view of McCallister et al. (US 6,005,897).

Regarding claim1:

As shown in figure 9 & 10, Cherubini et al. discloses a zero excess bandwidth modulation method, the method comprising:

- TH (Tomlinson-Harashima) precoding (figure 7, column 9, lines 58-64) of the sequence of discrete-valued modulation (figure 5, column 6, lines 66-67, & column 7, lines 1-3) symbols according to a predetermined overall channel symbol response having spectral zeroes at edges (column 8, lines 50-53, & column 10, lines 12-14) of a corresponding Nyquist band (column 6, lines 16-19), thereby generating a plurality of discrete-time transmit signals at a modulation rate (Discrete Fourier Transform DTF generates discrete signals in time domain) (figure 5);
- inserting the plurality of discrete-time transmit signals into means to generate a continuous-time transmit signal by appropriate discrete-time filtering, digital-to-analog conversion (DAC) (figure 10, column 8, lines 62-66), and continuous-time filtering (figure 4);
- ensuring, within the means to generate the continuous-time transmit signal (this limitation is part of digital to analog conversion) (figure 10, DAC, column 8, lines 63-66) that the continuous-time transmit signal has spectral zeroes at the edges of the corresponding Nyquist band, which equals a bandwidth of the available transmission band, and that any spectral components outside of the available transmission band are substantially suppressed (column 8, lines 16-19, & column 10, lines 12-27); and
- launching the filtered, continuous-time transmit signal into the communication channel (figure 10).

Cherubini et al. discloses all of the subject matter as described above except for specifically teaching encoding a plurality of information bits, thereby generating a plurality of encoding bits; rearranging an order of the plurality of encoded bits, thereby generating a sequence of discrete-valued modulation symbols.

However, McCallister et al., in the same field of endeavor, teaches encoding a plurality of information bits, thereby generating a plurality of encoding bits (52, 56, 62 in figure 3); rearranging an order of the plurality of encoded bits, thereby generating a sequence of discrete-valued modulation symbols (restructuring encoded bits by puncture controller is interpreted to be rearranging an order of the plurality of encoded bits. See figure 3 and col 7, lines 59-64) (62, 64, 68 in figure 3 and col 7, lines 59-67, col 8, lines 1-65).

One of ordinary skill in the art would have clearly recognized that in order to change a signal such as bistream into code format encoder devices are used. Encoding the data along with Trellis Coded Modulation (TCM) allows highly efficient transmission of information over communication channels. To convert the signal into bistream and output the complex symbols it would have been obvious to one ordinary skill in the art at the time the invention was made to use an encoder as taught by McCallister et al. in the Cherubini et al. system and method to provide good result during the code generation in the system. Also, it will allow the data to be transmitted over the communication channels more efficiently.

Regarding claims 2 and 14:

Cherubini et al. further discloses:

the predetermined overall channel response is characterized as

$$h(D) = 1 + h_1 D + h_2 D^2 + \cdots;$$
$$D = e^{-j2\pi fT} (= z^{-1});$$

f is frequency;

T is an inverse of the bandwidth of the available transmission band;

h1, h2, ... are constant valued coefficients; and

h(D) is zero when D = -1.

(please see column 6, lines 1-5 and equation (1):

$$y_k = \sum_{n=-\infty}^{\infty} \sum_{m=0}^{M-1} A_n^{(m)} a_{k-nM}(m).$$

Regarding claim 3:

Cherubini et al. discloses all of the subject matter as described above except for specifically teaching wherein the encoding of plurality of information bits further comprising: mapping the rearranged plurality of encoded bits into a plurality of modulation symbols according to a symbol constellation and a corresponding mapping function, thereby generating the sequence of discrete-valued modulation symbols.

However, McCallister et al., in the same field of endeavor, teaches teaching wherein the encoding of plurality of information bits further comprising: mapping (68 in figure 3) the rearranged plurality of encoded bits into a plurality of modulation symbols according to a symbol constellation and a corresponding mapping function, thereby generating the sequence of discrete-valued modulation symbols

(restructuring encoded bits by puncture controller is interpreted to be rearranging an order of the plurality of encoded bits. See figure 3 and col 7, lines 59-64) (62, 64, 68 in figure 3 and col 7, lines 59-67, col 8, lines 1-65).

One of ordinary skill in the art would have clearly recognized that in order to change a signal such as bistream into code format encoder devices are used. Encoding the data along with Trellis Coded Modulation (TCM) allows highly efficient transmission of information over communication channels. To convert the signal into bistream and output the complex symbols it would have been obvious to one ordinary skill in the art at the time the invention was made to use an encoder as taught by McCallister et al. in the Cherubini et al. system and method to provide good result during the code generation in the system. Also, it will allow the data to be transmitted over the communication channels more efficiently.

Regarding claims 4 and 16:

Cherubini et al. discloses all of the subject matter as described above except for specifically teaching: encoding a subset of information bits of the plurality of information bits into the plurality of encoded bits; and mapping the plurality of encoded bits and at least one uncoded information bits into the plurality of modulation symbols according to a symbol constellation and a corresponding mapping function, thereby generating the sequence of discrete-valued modulation symbols.

However, McCallister et al., in the same field of endeavor, teaches encoding a subset of information bits of the plurality of information bits into the plurality of encoded bits (52, 56, 62 in figure 3); and mapping the plurality of encoded bits (68 in figure 3)

and at least one uncoded information bits into a plurality of modulation symbols according to a symbol constellation and a corresponding mapping function (abstract), thereby generating the sequence of discrete-valued modulation symbols (62, 64, 68 in figure 3 and col 7, lines 59-67, col 8, lines 1-65).

One of ordinary skill in the art would have clearly recognized that in order to change a signal such as bistream into code format encoders. When modulating signal using modulation techniques such as Trellis Code Modulation (TCM), trellis encoders and constellation mapper are used. To convert the signal into bistream and output the complex symbols it would have been obvious to one ordinary skill in the art at the time the invention was made to use an encoder and a symbol mapper as taught by McCallister et al. in the Cherubini et al. system and method to provide good result during the code generation in the system. Also, it will allow the data to be transmitted over the communication channels more efficiently.

Regarding claims 5 and 17:

Cherubini et al. further discloses:

TH precoding (figure 7) operates on the discrete-valued modulation symbols to perform an inverse filtering operation in accordance with the predetermined overall channel symbol response and executes modulo operations to limit signals within a predetermined signal region (figure 5, IDFT, column 6, lines 51-55), thereby generating the plurality of discrete-time transmit signals at the modulation rate (figure 5).

Regarding claims 6 and 18:

Cherubini et al. further discloses:

the sequence of discrete-valued modulation symbols has a modulation type of at least one of PAM (pulse amplitude modulation), QPSK (quadrature phase shift keying), 16 QAM (quadrature amplitude modulation), and a higher-order QAM (claim 5, 1-3).

Regarding claims 7 and 19:

Cherubini et al. further discloses:

the encoding of the plurality of information bits thereby generating the sequence of discrete-valued modulation symbols involves at least one of uncoded modulation, TCM (trellis coded modulation), TTCM (turbo trellis coded modulation), LDPC (low density parity check) encoding and modulation, and concatenated encoding and modulation (column 9, lines 28-31).

Regarding claims 8 and 20:

Cherubini et al. further discloses:

the method is performed cooperatively within a communication transmitter and a communication receiver that are communicatively coupled via the communication channel (figure 9 &10).

Regarding claims 9 and 21:

Cherubini et al. further discloses:

- receiving a continuous-time receive signal from the communication channel (figure 10);
- converting the continuous-time receive signal into a discrete-time signal by means to perform appropriate continuous-time filtering, ADC (analog-to-digital conversion)

(figure 10, ADC), and discrete-time filtering (figure 10, LPF), thereby obtaining a plurality of discrete-time receive signals at the modulation rate (figure 10, DTF, T);

- ensuring, within the means to perform appropriate continuous-time filtering, ADC (figure 10, ADC), and discrete-time filtering (figure 10, LPF, that any signal and noise components (figure 10, NOISE) outside of the available transmission band is suppressed and that the discrete-time receive signal is shaped into a form corresponding to the predetermined overall channel symbol response that is assumed for the TH precoding (figure 7, TH Precoder), and
- decoding the plurality of discrete-time receive signals to generate best estimates of the sequence of discrete-valued modulation symbols and the information bits encoded therein (figure 7, T).

Regarding claims 10 and 22:

Cherubini et al. further discloses:

performing adaptive equalization when ensuring that the discrete-time receive signal is shaped into a form corresponding to the predetermined overall channel symbol response (column 7, lines 41-43, claim 17, lines 1-3) that is assumed for the TH precoding (figure 7, TH Precoder).

Regarding claims 11 and 23:

Cherubini et al. further discloses:

predetermined overall channel symbol response employed for TH referred to as h(D), is a finite impulse response (FIR)

$$h(D) = 1 + h_1 D + h_2 D + \cdots h_L D^L$$

for some finite positive integer L, or an infinite

impulse response (IIR) h(D) = p(D)/q(D);

$$p(D) = 1 + p_1 D + \cdots h_P D^P \text{ and } q(D) = 1 + q_1 D + \cdots q_Q D^Q$$

(please see column 6, lines 1-5 and lines 38-45, and equation (1)):

$$y_k = \sum_{n=-\infty}^{\infty} \sum_{m=0}^{M-1} A_n^{(m)} h_{k-nM}(m).$$

Regarding claims 12 and 24:

Cherubini et al. further discloses wherein:

h(D) = (1 + D)/(1 - pD) for 0 <<p <1.

(please see column 6, lines 1-5 and lines 38-45, equation (2)):

$$\sum_k h_k(i) h^*_{k-nM}(j) = \delta_{i-j}\delta_n, \quad 0 \le i, j \le M-1,$$

Regarding claim 13:

As shown in figure 9 & 10, Cherubini et al. discloses a zero excess bandwidth modulation communication transmitter, the transmitter comprising:

- a TH (Tomlinson-Harashima) precoder (figure 7, column 9, lines 58-64) that performs precoding of the sequence of discrete-valued modulation (figure 5, column 6, lines 66-67, & column 7, lines 1-3) symbols according to a predetermined overall channel symbol response having spectral zeroes at edges (column 8, lines 50-53, & column 10, lines 12-14) of a corresponding Nyquist band (column 6, lines 16-19, thereby generating a plurality of discrete-time transmit signals at a modulation rate

(Discrete Fourier Transform DTF generates discrete signals in time domain) (figure 5;

- means to generate a continuous-time transmit signal by appropriate discrete-time filtering, digital-to-analog conversion (DAC) (figure 10, column 8, lines 62-66), and continuous-time filtering (figure 4;
- wherein the plurality of discrete-time transmit signals is inserted into the means (figure 10, column 8, lines 62-66);
- wherein the means ensures that the continuous-time transmit signal (this limitation is part of digital to analog conversion) (figure 10, DAC, column 8, lines 63-66) has spectral zeroes at the edges of the corresponding Nyquist band, which equals a bandwidth of the available transmission band, and that any spectral components outside of the available transmission band are substantially suppressed (column 8, lines 16-19, & column 10, lines 12-27); and
- wherein the filtered, continuous-time transmit signal is launched into the communication channel from the transmit filter (figure 10).

Cherubini et al. discloses all of the subject matter as described above except for specifically teaching an encoder and symbol mapper that: encodes a plurality of information bits, thereby generating a plurality of encoded bits; and rearranges an order of the plurality of encoded bits, thereby generating a sequence of discrete-valued modulation symbols.

However, McCallister et al., in the same field of endeavor, teaches an encoder (56, 62 in figure 3) and symbol mapper (68 in figure 3) that: encodes a plurality of

information bits, thereby generating a plurality of encoded bits (see figure 3); and rearranges an order of the plurality of encoded bits (restructuring encoded bits by puncture controller is interpreted to be rearranging an order of the plurality of encoded bits. See figure 3 and col 7, lines 59-64), thereby generating a sequence of discrete-valued modulation symbols (62, 64, 68 in figure 3 and col 7, lines 59-67, col 8, lines 1-65).

One of ordinary skill in the art would have clearly recognized that in order to change a signal such as bistream into code format encoder devices are used. Encoding the data along with Trellis Coded Modulation (TCM) allows highly efficient transmission of information over communication channels. To convert the signal into bistream and output the complex symbols it would have been obvious to one ordinary skill in the art at the time the invention was made to use an encoder as taught by McCallister et al. in the Cherubini et al. system and method to provide good result during the code generation in the system. Also, it will allow the data to be transmitted over the communication channels more efficiently.

Regarding claim 15:

Cherubini et al. discloses all of the subject matter as described above except for specifically teaching wherein the encoder and symbol mapper maps the rearranged plurality of encoded bits into a plurality of modulation symbols according to a symbol constellation and a corresponding mapping function, thereby generating the sequence of discrete-valued modulation symbols.

However, De Gaudenzi et al., in the same field of endeavor, teaches wherein the encoder (56, 56 in figure 3) and symbol mapper (68 in figure 3) maps the rearranged plurality of encoded bits into a plurality of modulation symbols according to a symbol constellation and a corresponding mapping function (restructuring encoded bits by puncture controller is interpreted to be rearranging an order of the plurality of encoded bits. See figure 3 and col 7, lines 59-64), thereby generating the sequence of discrete-valued modulation symbols (62, 64, 68 in figure 3 and col 7, lines 59-67, col 8, lines 1-65).

One of ordinary skill in the art would have clearly recognized that in order to change a signal such as bistream into code format encoder devices are used. Encoding the data along with Trellis Coded Modulation (TCM) allows highly efficient transmission of information over communication channels. To convert the signal into bistream and output the complex symbols it would have been obvious to one ordinary skill in the art at the time the invention was made to use an encoder as taught by McCallister et al. in the Cherubini et al. system and method to provide good result during the code generation in the system. Also, it will allow the data to be transmitted over the communication channels more efficiently.

Conclusion

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to KABIR A. TIMORY whose telephone number is (571)270-1674. The examiner can normally be reached on 6:30 AM - 3:00 PM Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shuwang Liu can be reached on 571-272-3036. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Kabir A Timory/
Examiner, Art Unit 2611
/Shuwang Liu/
Supervisory Patent Examiner, Art Unit 2611